

Technol.
Man.

THE MANCHESTER
STEAM USERS' ASSOCIATION.

ESTABLISHED 1854.

MEMORANDUM BY CHIEF ENGINEER,

PRESENTED AT THE

ANNUAL MEETING

OF THE

GENERAL BODY OF THE MEMBERS,

HELD ON

TUESDAY, APRIL 5TH, 1898.

MANCHESTER:

"GUARDIAN" PRINTING WORKS, BLACKFRIARS STREET.

1898.

5256
22 | 10 | 98

THE MANCHESTER
STEAM USERS' ASSOCIATION.

ESTABLISHED 1854.

MEMORANDUM BY CHIEF ENGINEER,

PRESENTED AT THE

ANNUAL MEETING

OF THE

GENERAL BODY OF THE MEMBERS,

HELD ON

TUESDAY, APRIL 5TH, 1898.

MANCHESTER:

"GUARDIAN" PRINTING WORKS, BLACKFRIARS STREET.

1898.

MANCHESTER STEAM USERS' ASSOCIATION.

ACCUMULATED FUNDS, £19,000.

PRESIDENT:

ADAM DUGDALE, Esq., Blackburn.

VICE-PRESIDENT:

CHARLES HEATON, Esq., Bolton.

EXECUTIVE COMMITTEE:

RALPH PEACOCK, Esq., C.E., Gorton.	HERBERT H. SMITH-CARINGTON, Esq.,
HENRY HARRISON, Esq., Blackburn.	Openshaw, Manchester.
THOMAS PARKINSON, Esq., Manchester.	HAROLD LEE, Esq., Manchester.

TREASURERS:

WILLIAMS DEACON AND MANCHESTER AND SALFORD BANK, LIMITED.

CHIEF ENGINEER:

CHARLES E. STROMEYER, M.Inst.C.E., M.Inst.M.E.

SECRETARY:

ROBERT TONGE.

MANCHESTER STEAM USERS' ASSOCIATION.

9, MOUNT STREET, ALBERT SQUARE,
MANCHESTER,

Tuesday, 29th March, 1898.

TO THE EXECUTIVE COMMITTEE,
GENTLEMEN,

In preparation for the approaching Annual Meeting, allow me to lay before you a few remarks on the valuable services which my predecessor has rendered this Association, and a general review of our attainments, together with a few engineering matters.

A few details of Mr. Lavington E. Fletcher's early life will also not be out of place, as they explain in some measure how he acquired the varied experiences which guided him in his long and successful career as Chief Engineer of this Association. He was born in 1822, and at the age of 17 entered the engineering profession, to which he remained wedded for the remainder of his life—for 58 years. Shortly after the completion of his apprenticeship he had charge of the erection of the first engine, boiler, and biscuit machinery at Messrs. Huntley & Palmer's works. In 1842, when he was only 20 years old, he designed and made a steam motor car. For several years he was then engaged on railway engineering, and he designed the largest and last wood and iron trussed viaduct. He then took up the subjects of Naval Architecture and Marine Engineering designing several successful steamers, and after a short experience among hydraulic and electric machinery, he was, at the age of 39, appointed Chief Inspector to this Association. He at once identified himself with its aims and objects, and during the many years of his subsequent activity, he devoted himself with untiring zeal to the perfection of boilers, particularly Lancashire boilers, and to the combating of erroneous views which, based on ancient laboratory experiments, have persisted to this day. For these services the whole engineering profession owe him their deepest thanks, and, in addition, this Association owes him a debt of gratitude for having placed us at the head of all similar Associations. This he has done by perfecting a system of boiler inspection

which cannot be surpassed for reliability, and he, and his able assistant, Mr. Higebottom, on whom devolved the task of carrying out the system, could have boasted that during the 36 years of his leadership only one of our boilers has exploded from causes other than overheating. This was due to an external accident over which neither the Association nor the boiler attendant had any control. This beneficial work was carried on with such retiring modesty, that even now it will doubtless come as a surprise to many members that our average expenses for boiler repairs, in all cases due to oversights only of the attendants, amount to less than 7d. per annum per £1,000 guaranteed. Having for many years been connected with Lloyds' Register, I, like the rest of the world, look on their class 100 A1 as an absolute guarantee of perfect strength and efficiency. I am, therefore, most agreeably surprised to find that our inspections and reports are, if possible, even more impartial, thorough, and reliable than theirs. We are not content with an examination while building, and once every fourth year afterwards, but we inspect each boiler every year. It is one of their rules that every twelfth year, when a vessel passes through her No. 3 survey, two instead of one of Lloyds' surveyors have to inspect her. With us the system has been adopted of, as far as possible, not sending the same inspector to a boiler year after year; then the reports of these different inspectors are carefully compared, and any changes of form or increases of corrosion are carefully noted and reported, so that practically we do annually, what Lloyds' Register do only every twelfth year. This careful system was built up under the most discouraging circumstances. In our early days we were almost extinguished by a competition of Insurance Companies. Explosions were frequent; and as every new catastrophe with a prompt payment for damages was but an advertisement for more business, and therefore much talked about, many of our members became unnerved; and although we assured them that their boilers would not explode, they had not sufficient faith in us, and preferred to remain less fully informed about the actual condition of their boilers, but to insure them. They forgot that it was not only their property and their servants who were thus exposed to destruction or death, but they themselves might be the victims. On looking through the records of explosions it is curious to find how severely factory owners have been punished. Thus during the last five years, out of 215 deaths or injuries, 13 were suffered by factory owners, managers, or their sons, the actual rate being one per 15 workmen.

It was under such discouraging conditions that Mr. Fletcher joined this Association, and, after many fruitless attempts, Mr. Hugh Mason, our then President, was at last successful in getting a Bill passed through Parliament, according to which a Board of Trade Inquiry has to be held into each boiler explosion. Since then, but more particularly since 1895,

when 12 insured boilers exploded simultaneously at Redcar, both steam users and boiler insurers have grown more careful, and the number of serious explosions has been materially reduced. But Mr. Fletcher was not content with this result; he wished to see all boilers as safe as those of our members, and he overtaxed his strength when, in spite of his last illness, he exerted himself to get another Bill passed through Parliament, according to which boiler inspection was to be made compulsory. This system is in force in France, Belgium, and Germany, and from inquiries which I have made it seems to work well and with but little friction.

His single-handed exertions in this direction, which were evidently dictated by purely humanitarian motives, brought him into conflict with the various Boiler Insurance Companies whose interests his proceedings seemed to threaten. Cordial relations have, however, again been established.

Although Mr. Fletcher's life object seems to have been centred on the fulfilment of the above wishes, he was ever conscious of his duty towards this Association, and when, soon after the formation of the various Boiler Insurance Companies, competition grew so keen as to threaten our very existence, he undertook the task of arranging a system of boiler guarantees, according to which we bind ourselves not only to inspect boilers and report on their condition, but also to compensate steam users against the consequences of explosion as completely and with fewer reservations than if the boilers were insured. In fact, we take both the moral and pecuniary responsibility on our shoulders, and should it ever happen that one of our boilers were to explode, the Board of Trade Commissioners would hold us responsible and would fine us; whereas, should an insured boiler explode, Insurance Companies would not be fined if they had not thoroughly examined it. If, however, they had examined the boiler, but had not reported its dangerous condition to the owner, then they would be fined. Such cases are exceedingly rare. As a result of our modified policy, *i.e.*, guaranteeing the integrity and reliability of our inspection, the Association has prospered ever since; its membership has increased, and now includes many of the largest steam users of the United Kingdom, as well as many Corporations and the numerous War Office establishments. In fact, most of our members are steam users who attach more importance to an assurance that their boilers are safe, than to a promised compensation in case their boilers should explode.

Shortly after Mr. Fletcher's appointment, our example was for the first time successfully followed by the formation of other Boiler Inspection Associations which have survived to this day, the well-known Mulhause Association being the first. The Continent now possess about 40 of these Associations. Their difficulties, unlike ours, were connected with endeavours to obtain Government recognition of their inspectors and inspections,

whereby their members could be relieved of the inconvenience of Government supervision. They have been successful; but it appears to be an unwritten instruction, that the official sanction would be at once withdrawn if any of these Associations were to enter upon commercial transactions such as insurance. In those countries boilers are insured with the Fire Insurance Companies.

In a few months' time a turning point will be reached in our industrial history, which must have caused many anxious thoughts to manufacturers, and which has also engaged our serious attention. I am referring to the new Workmen's Compensation Act, which comes into force on the 1st July, this year. According to this Act, Employers will have to pay compensation in case any of their employés are killed or injured. In large works this risk can easily be borne by the employer. Smaller works will doubtless insure these risks, or combine and form mutual insurance clubs. In either case the question will always have to be asked: "Is your boiler safe?" If it has been guaranteed by this Association, I can unhesitatingly say that it is safe, or rather, that out of about 130,000 boiler inspections not one has ever shown itself to be unreliable.

For the information of those of our members who may wish to form themselves into mutual insurance clubs against the risks of the various Employers' Liability Acts, and also for the information of such Insurance Companies as take these risks, and who might wish to rely on our inspection as regards the safety of boilers, we have carefully examined the recent Board of Trade reports on boiler explosions with a view to determining the average risk attaching to the presence of a boiler.

A rough estimate fixes the number of boilers in the United Kingdom at about 180,000. These can be divided as follows:

Boilers guaranteed by the M.S.U.A....	...	about	6,000
Boilers insured	...	about	74,000
Boilers not officially inspected ...	...	about	100,000
Total ...			180,000

During the five years under consideration, there were 124 proper boiler explosions; these do not include burst pipes, kiers, stills, &c. There were no explosions among the guaranteed boilers, and there were 84 explosions among the uninspected boilers. The remainder, 40 in number, including insured boilers, need not be discussed.

An estimate of the cost of each of these 124 boiler explosions has been made on the following basis: Renewal of boiler if exploded, or renewal of flue tubes if collapsed; rebuilding of boiler shed or damaged factory,

compensation of £150, £300, and £500 respectively in case of death of labourer, skilled workman, or outsider, and 20s. compensation for 13 weeks for all injuries.

ESTIMATED AVERAGE COST OF A BOILER EXPLOSION DURING RECENT FIVE YEARS.			
	CLASS A.	CLASS B.	AVERAGE.
	£	£	£
Damage to boiler	105	270	135
Damage to property	125	185	135
Estimated payments for death... ..	64	125	75
Estimated payments for injuries	13	22	15
Board of Trade fines	8	8	8
Total average cost of one explosion...	£315	£610	£368

Class A includes such boilers as would have been guaranteed by us if found safe. Class B includes egg-ended and other antiquated boilers which would not be guaranteed by us under any circumstances.

With the help of this table, and remembering that there were on an average 17 real explosions among the 100,000 uninspected boilers, it will be found that the average cost of explosions amounts to only about 15 pence per boiler. About double this sum or even more would have to be added for repairs of minor boiler troubles which are not reported to the Board of Trade.

It would be for mutual insurance clubs against the Employers' Liability Acts and for Insurance Companies to decide whether these risks are sufficiently appreciable to demand an extra premium, or whether it is not better to insist that their members' boilers should be thoroughly inspected and guaranteed. In the latter case there would be practically no risk. As far as we have been able to ascertain, only two men have ever been injured by troubles connected with our boilers. The injuries were slight, and the total compensation which might have been due to them under the new Act, would not have amounted to more than £25. The above estimates have been communicated to the principal general Insurance Companies, and when effecting their insurances against the new Workmens' Compensation Act, our members will doubtless be able to obtain somewhat more favourable terms than would otherwise have been the case.

Many explosions are naturally due to carelessness on the part of the attendants, and although much can be done to avert danger by having boilers properly equipped with the necessary safety appliances, and also by letting the boilers have a large margin of safety, yet the explosion risks cannot be entirely removed, and this Association, at an early date of its existence, published the first Instructions to Boiler Attendants. A few years later Boiler Insurance Companies first came into existence and followed our example.

Some years ago, having made exhaustive experiments on the effect of introducing cold water into red-hot boilers, and finding that the ancient belief in the danger of this practice was unfounded, Mr. Fletcher carefully revised the old Instructions so as to embody all the most recent experiences and experiments. It has, however, been thought that boiler attendants would generally prefer shorter and more precise instructions, particularly in cases of emergency. New Instructions have therefore been printed and issued to the members of the Association. They are as follows :—

ADVICE TO BOILER ATTENDANTS.

GENERAL WORKING.

Treat your boilers with care and attention. Accidents are thereby prevented, expenses reduced, and the labour of firing lessened.

WATER LEVEL.—Before lighting fires, see that there is sufficient water in the boiler. Test the water gauges frequently, and keep the water level steady.

BLOW-OFF COCKS.—Before lighting fires be sure that the blow-off cocks are closed, and not leaking. Occasionally feel if the blow-off waste pipes are hot. Blow off from bottom before starting the engine. Sediment has then settled in the elbow pipe. Blow off the scum before stopping the engines, but only when the water level is at the correct height. At such times most of the scum has collected in the troughs.

LIGHTING FIRES.—Sudden changes of temperature may produce fractures or start leakages. Therefore never raise steam hurriedly. The top and bottom of a boiler should grow warm together. If convenient, fill the boiler with warm water through the economiser. If the boiler water is cold, allow fully six hours for raising steam. If pressed for time, fill the boiler to the top of the water gauge, fire slowly, and keep the safety valve open until steam blows off freely. After closing the safety valve, blow out the bottom cold water till the working level is reached. The pressure may now be raised more quickly.

SMOKE PREVENTION.—Smoke and imperfect combustion are caused by an insufficient air supply or by premature cooling of the flames. Therefore after coaling, when the fires are black, admit air either at the door or through the split bridge. It is less wasteful to admit too much air than too little. With smoky boilers, or when hard pressed, keep the fires thin and even. Fire steadily. Don't coal all furnaces at once. Coal each furnace on one side at a time.

EMPTYING BOILERS.—Do not empty the boiler while steam is up.

OVERHAULING, CLEANING, AND INSPECTION.—Clean the boiler monthly or oftener, remove the scale while soft ; if possible while emptying the boiler. Sweep the soot off the boiler plates and clean the flues every three months, as well as on the occasion of the annual inspection. All leakages should be stopped, any cause of dampness in the setting should be removed, corrosion should be arrested. The fusible plugs should be cleaned on the fire side and water side once a month, and the fusible metal should be renewed once a year at the time of the annual inspection. All cocks should be kept oiled, and unless asbestos packed, they should be overhauled once every month. These cocks, the feed valves, steam stop valves and all safety valves should be overhauled annually on the occasion of the inspector's visit.

WARNINGS.

MANHOLES.—Before opening the manholes ease the safety valve so as to be quite sure that there is no pressure in the boiler. Before entering a boiler secure the steam valves and blow-off cocks.

SAFETY VALVES AND LOW WATER ALARMS.—The most disastrous explosions have happened with boilers whose safety valves had been jammed down or overloaded. Never overload or tamper with safety valves or with low water alarms. Ease or test them regularly every day. Be sure that they are in working order. If they will not work properly, reduce the steam pressure and then report to the manager. In doubtful cases he should write to the Manchester Steam Users' Association.

STEAM STOP VALVES AND STEAM PIPES.—Numerous fatal accidents have happened to boiler attendants while opening valves or drain cocks of steam pipes which had accidentally become filled with water. This water should be drained off, but only when the pipe is shut off from the boiler. The cracking noises which are sometimes heard in steam pipes, generally when opening a steam stop valve or a drain cock, are a sign that water is being shot about by the live steam. Retire at once, for the next blow may be an explosion. Steam pipes which slope downwards from the boiler stop valve to the engine appear to be quite safe. Horizontal pipes, particularly if their ends are turned up, are dangerous. They should be fitted with steam traps or at least with drain cocks, and should always be kept dry.

COLLAPSED FURNACES.—(1) If, during the ordinary working of a Lancashire or Cornish boiler, the water was seen in the glass less than half an hour ago, but has disappeared, due to the feed having stopped, then probably no harm has yet been done. If the water was not seen for a long time, or if a mistake was made when last looking at the gauge glass, or if the water has disappeared suddenly and unaccountably, then there is a possibility that the furnace tops have come down, or are coming down, due to overheating. In either case, cool the plates from both sides as quickly as possible. Open the furnace doors to admit cold air, but don't disturb the fires, ease the safety valves so as to cause priming. The rising froth is not so dangerous as cold feed water, and will help to cool and stiffen the over-heated plates. Afterwards increase the feed till the water shows in the gauge glass.

COLLAPSED FURNACES.—(2) If there is much scale, oil, or refuse in the boiler, the furnace sides and not the tops usually bulge in, generally very slowly. In this case cool the plates from the fire side ; open the doors ; if possible, cover the fires with damp ashes.

These accidents should be reported to the Manchester Steam Users' Association at once.

When exposed to these dangers the boiler attendant may prefer to retire. He should certainly not expose himself unnecessarily in front of the furnaces, and should warn others of the danger.

GENERAL WARNINGS.

- Don't overload the safety valves or tamper with them.
- Don't let the water-level sink out of sight.
- Don't allow the gauge cocks to set fast.
- Don't open the steam stop valves hurriedly.
- Don't empty the boiler while steam is up.
- Don't use unknown scale solvents or compositions.

CHARLES E. STROMEYER, M.I.C.E.,
Chief Engineer.

*Manchester Steam Users' Association,
9, Mount Street,
Albert Square, Manchester.*

It will be noticed that the suggestions as to the general working of a boiler have been very much curtailed. This has been done to save space, and on the assumption that a fireman has had some training in his calling and merely requires hints to help him over difficulties. The only important addition which has been made to this part of the "Advices, &c." is that relating to the scaling of boilers. In 1892, M. Schmidt, Engineer of the Association of Steam Users of the Somme, Aisne, and Oise, read a paper before the sixteenth Congress of Chief Engineers on a new method of cleaning boilers which had been re-discovered and adopted by one of his steam users, and which is as follows: The boiler is cooled down without running out its water. After a few days, when the temperature has fallen sufficiently to allow a man to enter, the top manhole door is removed, the water is lowered to about 1ft. below the furnace crown, and the boiler cleaners enter the boiler armed with brushes, scrapers, and, if necessary, with a high pressure water hose. They find the scale to be soft, almost muddy, and can remove it with the greatest ease. When they have cleaned the upper part of the boiler, the water is lowered 1ft. at a time as the cleaning progresses. By this means all new scale can be removed in a few hours. Should the work of cleaning the boiler not be commenced until one hour after the water has been run out, then the scale will already have become hard, and can only be detached from the plates by the tedious process of chipping. If the water is blown out under pressure the scale, being left in a dry and hot condition, is doubly hard and adhesive. Old scale, which has been in the boiler for years, does not soften again, but after a time it also yields to this treatment. On the other hand, boilers which do not readily scale, can be partially protected against corrosion by emptying them while they are still warm, when the undisturbed thin scale will harden on the warm surfaces. Inquiries made amongst our inspectors revealed that this method of cleaning had, years ago, been adopted by

some steam users, and also that it was perfectly true that boiler scale is soft as long as it has not been exposed to the air, and in all recent cases where members were troubled with scale, and where the conditions were otherwise favourable, they have been advised to adopt this plan. Although boilers can thus be freed from scale more easily and in a much shorter time than if they are allowed to dry, it will be found that the men prefer the more unsatisfactory and costly process now in use; a suit of oilskins to protect them from the wet might be found an inducement to convert them to work this method satisfactorily.

Economisers should be cleaned on the same plan, all the top caps being removed and the pipes kept full of water while the scale is being detached and converted into mud by light iron scrapers. One-inch gas pipes, to which a serrated disc or pipe couplings have been screwed, will do excellent service. When all the pipes have been cleaned, the accumulated mud is removed from below.

In recent years water-tube boilers have for certain purposes been frequently employed, but they give much trouble if the water is sedimentary. In such cases it is suggested that the scale should be similarly removed, if possible under water, the top tubes being cleaned first, and no water being let out except through the top holes of the tube to be cleaned.

The above instructions will, it is hoped, be followed wherever possible, not only for the purpose of increasing the efficiency of boilers, but more particularly for the purpose of reducing their wear and tear. It must be obvious that scale, which is a hundred-fold worse heat conductor than iron, must, if it coats the heating surfaces, cause them to be overheated. Instead of acquiring the temperature of the boiling water, which is fairly constant, and with which the plates should be in immediate contact, their temperature fluctuates up and down in harmony with that of the flue gases. No wonder, then, that riveted seams are strained until they open and leak. Frequently even the rivet holes crack, and no wonder also that corners and flanges pant, crack, groove, and finally wear through. This trouble can generally be prevented by keeping the scale thin. The more serious dangers (collapsed furnaces) of allowing scale to accumulate excessively are too well known to be referred to here, but in avoiding them steam users should be careful about going to the other extreme and banishing scale entirely. They would then find that unless the necessary chemicals are added, some waters will seriously corrode their boiler plates.

The introduction of condensing engines has led to much trouble from grease in the boilers; furnaces, particularly in heavily fired boilers, having frequently collapsed without any apparent cause, for the film of oil which does the mischief is so thin that it is not easily detected, and it generally

gets charred and disappears as soon as the furnaces have grown hot. The importance of attending to this matter will be apparent when it is remembered that most hydrocarbon lubricants are exceptionally bad conductors of heat, a thin film of only $\frac{1}{100}$ in. in thickness retarding the heat as much as or even more than a layer of scale $\frac{1}{10}$ in. thick, or as a steel plate 10 in. thick. If mineral oils have been let into a boiler they cannot be removed like vegetable oils by introducing caustic soda, and the only really effective way of removing them is to allow a thin scale of mineral matter to accumulate and to remove it together with the adhering oils. By far the better plan is, however, to keep these oils out of the boilers. This is done with reasonable efficiency by passing the feed water through a feed filter. This filter should be arranged so that it can be blown through, whereby the accumulated grease is discharged, and the attendant should be instructed to keep the filtering material as clean as possible.

Besides using this appliance it will be well worth the most serious consideration of steam users to reduce the amount of lubricating oil used in their cylinders. On many of the largest steamers now running no oil is introduced into the cylinders, except a few drops at the commencement and at the end of each voyage, which often extends over a few weeks. It is found that the moisture in the steam, amounting generally to more than 25 per cent., is an excellent lubricant both for the slide valves and the pistons.

The sub-section "Warnings," in the above "Advice to Boiler Attendants," is a new departure, and some of the subjects found therein deserve a few passing remarks.

An examination of the Board of Trade reports shows that steam pipes frequently explode, due to what is commonly known as water-hammer action. In such cases, it appears that water accumulates in some low-lying part of a steam pipe; its upper surface where it is in contact with the steam is hot, but the undisturbed water under this film is cold. A slight agitation of this water, caused perhaps by the opening of a stop valve, or of a drain cock, may suddenly bring the cold portion of the water into contact with the steam, a sudden condensation takes place, a vacuum is formed into which the column of water rushes with an accelerated velocity, and being then brought to an abrupt standstill, strikes a most intense blow against the valve or the steam pipe, which, no matter how strongly they are made, in most cases are then shattered. As such accidents occur very suddenly, and often without apparent causes, it was thought well to address a few words of warning to the boiler attendants, particularly as they are the chief sufferers. As pointed out in the "Advises," steam pipes can be so designed that no water will find a lodgment in them, and all danger of explosion is removed.

One very important distinction has for the first time been made in these "Advices" as regards the causes of collapsed furnaces and how such cases should be treated. When there is shortness of water the obvious remedy is to raise the water level, and this can be most quickly done by producing artificial priming, cold water being added soon after. If cold water were to be added at first, the immediate result would be a lowering of the water level, and the uncovered plates, which may be nearly red hot, might give way before the water level can be slowly raised to the necessary height by the feed pumps. If the overheated plates are covered with water but separated from it by layers of scale, grease, or refuse, it is obviously useless to add more water, and the best remedy must be to cool the fires. Most other "Instructions" to firemen make a distinction under these circumstances as to whether the furnace plates are red hot or not; but it is clearly impossible for anybody to look at a sooty furnace top exposed either to the flames or to the glare of a clear fire and to form an opinion as to whether the plate is overheated or not. A fireman could certainly not assure himself on this point, and would therefore be in doubt as to how to act. Besides it is dangerous for him to get in front of the furnace.

During the past year only one evaporative boiler trial has been carried out; it was made on a Lancashire boiler fitted with a patent smoke consuming furnace, but the report is not yet sufficiently advanced to be included in these remarks.

I am pleased to be able to report that the work of this Association has still further increased during the past year. The membership, the number of boilers inspected, and the engines indicated have considerably increased. We are now frequently asked to give advice on alterations to engines and laying down new ones. It is also very gratifying to find that members and outsiders are more largely than ever availing themselves of this Association for drawing up the specification for new boilers and for their inspecting during construction. As Mr. Fletcher devoted years of untiring attention to the perfection of the Lancashire boiler, with which his name will ever be honourably associated, and as this Association can now boast that 2,000 of its boilers were built to its specification and under its inspection and have been most carefully watched ever since, it is but natural that not only our members, but Government Departments, Town Councils, and even Consulting Engineers should come to us for advice, and entrust us with the design and inspection of their boilers.

I am, Gentlemen,
Yours faithfully,

C. E. STROMEYER,

Chief Engineer.

DISTINCTIVE FEATURES OF THE MANCHESTER STEAM USERS' ASSOCIATION.

This Association was founded in the year 1854, by Sir William Fairbairn, C.E.; Sir Thomas Bazley, M.P.; Sir Joseph Whitworth, Bart., C.E.; Henry Houldsworth, Esq., and other philanthropic gentlemen, for the purpose of preventing steam boiler explosions by competent scientific inspection of the boilers, and thus of saving human life.

This Association was the first institution to establish periodical boiler inspection on a practical basis.

The Association is not a Joint Stock Company. There are no shareholders to whom dividends are paid out of the members' subscriptions, but the income is appropriated solely to promote the direct objects of the Association. The Committee of Management is elected annually at a general meeting of the body of subscribers.

After a boiler has been examined and found fit for its working pressure, the Association gives a pecuniary guarantee of its safety to the extent of £1,000. In the event of explosion the guarantee covers both loss of life and property, as well as claims under the Employers' Liability Act. The Association does not guarantee boilers on the principle of averages, but as the result of competent scientific inspection. Its object is Prevention, not Compensation; and its fundamental principle is—*No Inspection, No Guarantee*. The Association has never lost a life from the explosion of any boiler guaranteed by it.

MANCHESTER STEAM USERS' ASSOCIATION.

PAST PRESIDENTS.

	YEARS.
MR. HENRY HOULDSWORTH	1855—58
SIR WILLIAM FAIRBAIRN, BART., C.E., F.R.S. ..	1858—74
MR. HUGH MASON, M.P.	1875—86
MR. RICHARD PEACOCK, C.E., M.P.	1886—89
MR. HENRY LEE, M.P.	1889—93

PAST VICE-PRESIDENTS.

MR. EDMUND ASHWORTH.	MR. JOHN PENN, C.E., F.R.S.
SIR THOMAS BAZLEY, BART., M.P.	MR. JOHN RAMSBOTTOM, C.E.
MR. CHARLES F. BEYER.	SIR JOSEPH WHITWORTH, BART., F.R.S.

DISTINCTIVE FEATURES OF THE MANCHESTER STEAM USERS' ASSOCIATION.

This Association was founded in the year 1854, by Sir William Fairbairn, C.E.; Sir Thomas Bazley, M.P.; Sir Joseph Whitworth, Bart., C.E.; Henry Houldsworth, Esq., and other philanthropic gentlemen, for the purpose of preventing steam boiler explosions by competent scientific inspection of the boilers, and thus of saving human life.

This Association was the first institution to establish periodical boiler inspection on a practical basis.

The Association is not a Joint Stock Company. There are no shareholders to whom dividends are paid out of the members' subscriptions, but the income is appropriated solely to promote the direct objects of the Association. The Committee of Management is elected annually at a general meeting of the body of subscribers.

After a boiler has been examined and found fit for its working pressure, the Association gives a pecuniary guarantee of its safety to the extent of £1,000. In the event of explosion the guarantee covers both loss of life and property, as well as claims under the Employers' Liability Act. The Association does not guarantee boilers on the principle of averages, but as the result of competent scientific inspection. Its object is Prevention, not Compensation; and its fundamental principle is—*No Inspection, No Guarantee*. The Association has never lost a life from the explosion of any boiler guaranteed by it.